Course Code MAT 2002	Discrete Mathematics and Graph Theory	Course Type : LT Credits:4
Prerequisite:	Basics of algebra	

Objectives:

To provide fundamental ideas on Discrete Mathematics and Graph theory required for the study of Computer Science

Expected Outcomes:

By the end of the course, students should be able to

- appreciate the power of discrete mathematics and Graph theory and use them to design mathematical model
- analyze the problems connected with data analysis that arise in their respective engineering courses.
- Emphasize the study of computational and algorithmic aspects of Graph Theory

Student Learning Outcomes (SLO):	**a,e,j,k**

Module No	Module Contents	No. of lectures	SLOs
1	**Set Theory and Boolean Algebra** Relations and Functions, Partial Order Relations, Lattices, Boolean Algebra, Laws of Boolean Algebra, Boolean Functions- Normal Forms, Application of Boolean Algebra to Switching Circuits.	9	a,e,j,k
2	**Predicate Calculus** Introduction -Statements and Notation – Connectives – Tautologies, Logic - Equivalence - Implications, Laws of Statement Calculus. The Theory of Inference for the Statement Calculus. Predicate and Quantifiers- Nested quantifiers-Rules of Inference for Predicates, Rules for Inference for Quantified Statements.	7	a,e,j,k
3	**Fundamentals of graphs** Graphs – introduction – isomorphism – sub graphs – walks- paths - circuits – connectedness – components – Euler graphs – Hamiltonian paths and circuits.	9	a,e,j,k
4	**Trees, Fundamental circuits and Cut sets** Trees – properties of trees – distance and centers in tree – rooted and binary trees - spanning trees – spanning trees in a weighted graph. Cut sets – properties of cut set – fundamental circuits and cut sets	9	a,e,j,k
5	**Matrix representation of graphs** Incidence matrix – sub matrices – circuit matrix – path matrix –	9	A,e,j,k

	adjacency matrix. Chromatic number **Directed graphs, Graph Theoretic algorithms** Digraphs – types of digraphs – directed paths and connectedness – Euler graphs – adjacency matrix of a digraph - tournament. Algorithms - connectedness and components – spanning tree – fundamental circuits – cut vertices – directed circuits – shortest path algorithm.		
6	**Guest Lectures by experts on contemporary topics**	**2**	
	.	**45**	

Mode of Teaching and Learning:
Class room teaching
Use of mathematical software (such as MATLAB, MATHEMATICA, SAGE, ETC.) as teaching aid
Minimum of 2 lecture periods by experts on contemporary topics

Mode of Evaluation and assessment: Digital Assignments, Continuous Assessment Tests, Final Assessment Test and unannounced open book examinations, quizzes, student's portfolio generation and assessment, innovative assessment practices

Text Books:		9+3 hours
1.	Kenneth H. Rosen, Discrete Mathematics and its applications, 6th Edn., Tata McGraw Hill,(2003)	
2.	Narasing Deo, Graph theory with application to Engineering and Computer Science, Prentice Hall India (2010).	
3.	Fundamentals of Discrete Math for Computer Science- A Problem-Solving Primer by Tom Jenkyns and Ben Stephenson , Springer-Verlag , 2013.	
4	Mathematics of Discrete Structures for Computer Science by Gordan J.Pace, Springer-Verlag , 2012.	
Reference Books:		
1.	West, D.B, Introduction to Graph Theory, second ed., *Prentice-Hall,* Englewood Cliffs, NJ, (2001).	
2.	Discrete Mathematical Structures by Kolman, R.C.Busby and S.C.Ross, 6th Edition, PHI , 2009.	
3.	E.M.Reingold, J.Nievergelt**,** N.Deo, Combinatorial Algorithms: Theory And Practice, Prentice Hall, N.J (1977).	
4	Richard Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education, 2001.	

Recommendation by the Board of Studies on	19 June 2019
Approval by Academic council on	18-07-2018
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